

SOME NOTES ON THE BRAZILIAN FLORA

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In these days of easy and rapid travel, it is possible, with comparatively little effort, to visit pretty much every part of the world; and even the ordinary summer vacation is long enough to reach what a generation ago would have seemed impossibly remote regions.

Probably no country is so rich, botanically speaking, as Brazil, occupying as it does an area larger than the continental United States, and lying mostly within the tropics. It includes much the greatest expanse of equatorial territory of any country in the world; and this equatorial region, with the adjacent territory, supports the most extensive forest on the globe. A large part of the thousands of species of woody plants, as well as an immense number of herbaceous species, are still undescribed.

The exploration of the trackless jungles, often under water for months at a time, and exposed to attacks of hostile natives and deadly disease, is no doubt perilous, and only possible by well organized expeditions; but it is not at all necessary to expose one's self to these risks in order to get a very satisfactory idea of the more salient features of the rich Brazilian flora. It is now possible to make the voyage to Brazil not only with comfort, but with all the conveniences of a modern ocean liner. Less than a fortnight will carry the traveler from New York to Rio de Janeiro, and as the seasons are reversed, we may escape the mid-summer heat of New York, and after a perfect trip through the blue tropical seas, arrive in Rio at the end of winter, when the weather is about as perfect as we can find anywhere.

The beauty of the famous harbor of Rio cannot be exaggerated, and the city is one of the most attractive of world capitals. But what is of special interest to the botanist are the opportunities offered within the city for studying the native vegetation. The coastal region is very mountainous, and the highest peaks in Brazil are not very far from Rio. The seaward slopes receive a heavy rainfall, and support a dense forest of truly tropical character. Although Rio lies very near the Tropic of Capricorn, many species closely related to the Amazonian region are found. Within the city there are mountains over 2000 feet high on whose slopes are forest areas which are easily accessible and which afford a most satisfactory picture of the tropical jungle, the trees supporting huge lianas and loaded with epiphytes in great variety. Palms are a marked feature of these forests; ferns in bewildering variety, Araceae, gingers, Begonias, and other showy herbaceous forms and shrubs make up the dense undergrowth covering the floor of the jungle.

Rio was reached July 27, and I was surprised to find the air almost too cool after the voyage across the equator. The next day, with a chilly rain, was anything but tropical; but thereafter an unbroken succession of warm sunny days left little ground for complaint.

My first impression of the Brazilian forest was received a few days later when I took a popular motor trip over what was the most spec-

tacular drive that I have ever seen within a city. The road passed around the bases of two of the mountains rising within the city and reached an elevation of about 1000 feet with magnificent views over the city and the bay. In places it traversed magnificent forest, full of all manner of interesting things. Palms and tree-ferns in great variety were a feature of the vegetation, while the trees were draped with lianas among which climbing Araceae, *Philodendron* and others were conspicuous. Characteristic epiphytes, the bromeliads and orchids, as well as ferns, were in profusion. It was too early in the season to see these at their best, so except for a few bromeliads—probably species of *Tillandsia* whose scarlet-bracted spikes were conspicuous—none were seen in flower. An examination of the banks along the road showed great quantities of small ferns and liverworts, the latter being especially interesting.

Southern Brazil is famous for showy-flowered trees and shrubs. An *Erythrina* with vermilion-scarlet flowers was common, but still more striking was a species of *Tibouchina* (Melastomaceae), a shrub or small tree covered with big violet-purple blossoms. These hinted at what might be expected later in the season. Among the most characteristic smaller trees were several species of *Cecropia* with big palmate leaves somewhat suggesting *Ricinus*. Returning, the road followed the ocean shore for several miles. On the relatively bare and exposed hillsides, were many coarse bromeliads, some small columnar cacti, and Agave-like *Fourcroyas*.

The botanical garden in Rio is one of the best, in some respects perhaps second only to the famous gardens at Buitenzorg. In a recent number of "*Torreyana*"*, Mr. Norman Taylor has given an interesting account of the garden, with special attention to the economic plants. The gardens are most picturesquely placed at the foot of the Corcovado, the highest mountain in Rio, and the woods at the foot of the mountain immediately adjoin the gardens. The gardens were established more than a century ago, and therefore contain many magnificent specimens of trees, both native and exotic. Here may be seen full-grown specimens of many of the native forest trees, which give some hint of the amazing richness of the Brazilian forest. The collection of palms is probably second only to that at Buitenzorg and even the famous Japanese garden can show nothing equal to the great avenue of *Oreodoxa oleracea* (Fig. 1) (usually confused with *O. regia*, a much inferior species). This most beautiful of all palms was introduced from the West Indies, and the original tree, planted in 1808, is still flourishing. The great central avenue is over 80 years old, and the tree is now extensively planted all over the city, of which it is a most beautiful and striking feature.

Space forbids more than the briefest account of the trees. Of the native species, the largest number are Leguminosae—e. g. *Erythrina*, *Pithecolobium*, *Cassia*, *Inga*, *Caesalpinia*, etc.—each with many species and many with very showy flowers. Other characteristic families are Myrtaceae—*Myrtus*, *Eugenia*, etc.; Bombacaceae—*Bombax*, *Ceiba*

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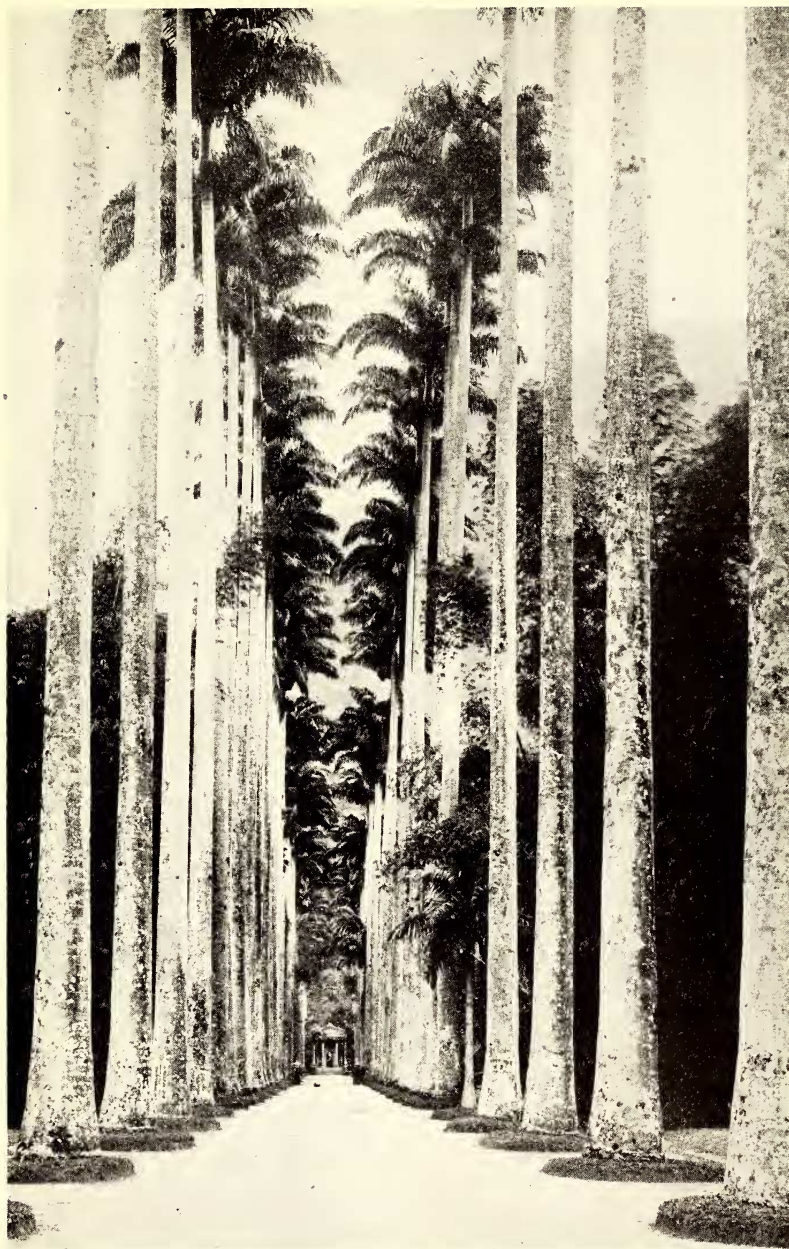


Fig. 1. Palm Avenue (*Oreodoxa oleracea*), Botanical Garden, Rio de Janeiro.

(Fig 2)—giants of the Brazilian forest; Jacaranda and Tecoma of the Bignoniaceae, with very showy flowers. There are also many Lauraceae, Anonaceae, Sapotaceae, Malpighiaceae. A very characteristic tree is the monkey-cup or "Sapucaya," related to the Brazil-nut (*Bertholletia*). The globular woody capsules open by a circular lid and are very conspicuous especially when the trees are bare of leaves as they are in winter. Of the Coniferae there were good specimens of the native *Podocarpus Sellowi* and *Araucaria brasiliana*. Several cypresses, some from Mexico and western America, seemed to find congenial conditions, but none of the pines or firs was noted. I was interested to see *Roupala heterophylla*, one of the few South American Proteaceae, a family mainly confined to Australia and South Africa.

Brazil probably surpasses all countries in the number of palms and these are well represented in the botanical garden. *Cocos* probably leads in number of species; others—e. g. *Attalea*, *Scheelia*, *Maximiliana*, have enormous pinnate leaves; *Euterpe*, among the most graceful of palms; *Mauritia*, stately fan palm. Of the less conspicuous genera, *Bactris* and *Geonoma* are common as under-growths in the forest.

The characteristic epiphytes are amply represented in the garden. Epiphytic ferns, bryophytes and lichens are abundant, the latter being especially common on the smooth trunks of some of the palms where the silvery-gray and pink discs are very conspicuous. Orchids are abundant, but only a few were in flower; and of the bromeliads, which are very numerous (both epiphytic and terrestrial species), the majority were not in bloom. Besides the many species of *Tillandsia*, may be mentioned species of *Bilbergia*, *Vriesia* and *Aechmea*. *Aechmea sphaerocephala*, a large terrestrial species, looks somewhat like an *Agave*, and the big globular inflorescences have broad blood-red bracts and blue flowers. Cacti also appear as epiphytes, species of *Phyllocactus* and *Rhipsalis*, the latter being very abundant about Rio. The great masses of pendant smooth cylindrical branches bearing tiny whitish flowers are very different from any other cacti. *Rhipsalis* is especially interesting as it is the only genus of Cactaceae which occurs in the Old World. *Rhipsalis cassytha* is said to occur both in Brazil and West Africa and is also recorded from Ceylon and Madagascar.

While to the botanist the rich collection of native plants will be of first interest, the splendid specimens of many exotics also offer a great attraction. Some, like the many gigantic specimens of the "Traveller's Tree" (*Ravenala*), are much the finest I have ever seen, and there are splendid examples of many other denizens of the eastern tropics. One of these, a very handsome ginger (*Phaeomeria magnifica*), recalled happy collecting trips in the mountain forests of Java and Sumatra where it is common. Extensive collections of bamboos, screw-pines (*Pandanus*) and Old World palms, especially some very luxuriant rattans, were all reminiscent of the eastern tropics.

I am much indebted to the courtesy of the Director of the Gardens, Dr. Pacheco Leão, in my studies at the garden, and also for photographs of the garden. I would also like to express my thanks to Miss Maria Bandeira of the herbarium for frequent assistance.

The botanical attractions of Rio are by no means confined to the botanical garden. The city is adorned with numerous parks and gar-



Fig. 2. Silk-cotton tree (*Ceiba pentandra*), Botanical Garden, Rio de Janeiro.

dens, both public and private, in which are growing many beautiful trees and shrubs, both native and exotic. Along the boulevards I noticed as a shade tree a small-leaved evergreen fig, probably *Ficus Benjamina*, a fine East Indian species. *Oreodoxa oleracea* was very common as an avenue tree, and many other palms were frequent. At the time of my visit, August, the most conspicuous objects in the gardens were huge bushes of *Poinsettia* in full bloom. The Brazilians are great flower lovers, and the flower market in Rio is one of the sights of the city. The flowers included roses, pinks, dahlias, and other familiar ones: and, early as it was, I noted several orchids, one of which, a fine purple *Cattleya*, was evidently grown in quantity.

An interesting trip was made from Rio to Petropolis, a summer resort in the mountains at an elevation of about 2500 feet. The railway runs for a considerable distance near the shore of the bay through a more or less open country before the steep climb up the mountains. Some of the lowland is swampy and a few mangroves were noted, but no dense mangrove formation. The handsome fern, *Acrostichum aureum*, so often associated with the mangrove formation, was common. Another wide-spread littoral species was *Hibiscus tiliaceus*, the "Hau" of Hawaii. Much of the open country was covered with dense scrub looking as if the land had been cleared of forest. Palms were abundant, especially species of *Cocos* and *Acrocomia*, as well as smaller species which could not be identified. A fine scarlet *Erythrina* was abundant and many small flowered *Melastomaceae*, white and blue *Ipomoeas*, purple and red *Lantana*, and *Eupatorium*.

The ascent to Petropolis is very steep, and in places the mountainsides are densely wooded. About Petropolis the forest presents a less tropical aspect than that in Rio. The development of lianas and epiphytes is much less marked and indicates a colder and dryer climate. This is also evident in the smaller number of palms, *Araceae* and *Scitamineae*. Tree-ferns were common and taller than those near Rio; the walls and banks also furnished some interesting hepatics. The most novel botanical feature was *Araucaria braziliiana*, apparently indigenous. In the old tree all the branches die except those at the top which form an almost flat disc surmounting the bare trunk. In the gardens were unusually fine specimens of the Australasian *A. excelsa* and *A. Cookii*. Another very striking native tree was a large *Erythrina* which was a magnificent sight, as the leafless branches were solid masses of brilliant scarlet flowers.

The gardens of Petropolis were very attractive. The climate, which is cooler than that of Rio, seems particularly suited to flowers of warm temperate climes, while palms of various kinds also thrive. Roses were abundant and beautiful, while huge bushes of Indian Azaleas were masses of superb flowers. *Rhododendrons* and *Camellias* of tree-like dimensions were seen, but were much less floriferous than the azaleas. A few peach trees were in flower, but did not look at all flourishing, and I believe never ripen satisfactorily. *Bignonia venusta* and *Thunbergia grandiflora* were the most conspicuous creepers, and *Poinsettias* were common but not equal to those in Rio. It is said that orchids and other flowers are grown commercially on a large scale in Petropolis for the Rio market.

São Paulo, the second city of Brazil, is much less attractive than Rio from the tourist standpoint, being a big modern commercial city, the center of the great coffee industry; but it has certain very strong interests for the botanist. There is a fine scientific museum and a biological institute with excellent botanical collections. A notable feature of the museum is a small botanical garden with a most interesting collection of native plants, looking like a bit of real jungle and the result of many years' labor. This unique little forest shows well grown trees of various kinds, tree-ferns and palms, big lianas, numerous epiphytic orchids and bromeliads, and a large variety of herbaceous plants. Another part of the garden is devoted to plants of the open—cacti, Agaves, Fourcroya, Tibouchina, Salvia, various grasses, etc. There was also a small aquatic garden, where I recognized a familiar species of our eastern States, the pickerel weed, *Pontederia cordata*.

My main reason for visiting São Paulo was to see the Biological Station of Alto da Serra, which is about an hour's ride by train from São Paulo. São Paulo lies about 2500 feet above sea level on a plateau which descends abruptly to Santos, the port of São Paulo. The biological station is at the edge of the plateau, and close to the railway between the two cities. An excellent account of the station was given by Dr. A. F. Blakeslee* about two years ago, and it was his paper that called my attention to this remarkably interesting place. Too much praise cannot be given to Professor F. C. Hoehne, mainly through whose efforts this magnificent sample of the virgin mountain forest has been preserved. It is to be hoped that means may be secured for acquiring a much larger area, and for extending the facilities for the accommodation of visiting scientists. I shall not soon forget the delightful day spent at the station under the guidance of Professor Hoehne.

There is a very abrupt descent from the edge of the plateau, and the conformation is such that there is a very heavy rain-fall at the summit—about four meters annually. There is also much fog, so that there is developed a rain-forest of the most pronounced type with an amazingly luxuriant vegetation. It is hard to realize that it lies at the extreme verge of the tropics, as the aspect of the forest interior is almost that of an equatorial jungle, except that none of the trees are of great size and lianas are not conspicuous. Space forbids a detailed account of this truly wonderful forest, and only a few of the most notable features that impressed the writer can be mentioned. For a fuller account with a number of admirable photographs, the reader is referred to Dr. Blakeslee's interesting paper.

The heavy rainfall and constant humidity result in a profusion of epiphytic growths which surpasses anything which I can recall from the eastern tropics. The Bromeliaceae, a large number of which are epiphytes, comprise many species of *Tillandsia*, *Vriesia*, *Nidularia*, *Bilbergia* and others. Some were in flower, their red and yellow, or pink and blue inflorescences being very showy. Some 250 species of orchids have been collected including some very handsome ones. Several species were seen in flower, perhaps the most striking being

* A Paradise for Plant-lovers, Scientific Monthly, July, 1927.

Sophronitis coccinea, an epiphytic species with scarlet star-shaped flowers. This was quite common, and could not fail to attract the most unobservant. Of the terrestrial species, several specimens of the very showy *Zygopetalum Mackayii* were found in an open boggy place. Of the woody plants, species of *Gaultheria*, *Gaylussacia*, *Psidium*, *Fuchsia* and *Tibouchina* were noted; herbaceous species included, *Drosera villosa*, *Eriocaulon*, and the very remarkable *Utricularia reniformis* which grew in the water held between the leaf bases of a species of *Vriesia*. The basal portion of the *Utricularia*, lying in the water, shows the characteristic vesicles, but there are developed large orbicular aerial leaves which look almost like small water-lily leaves. The flowers are said to be large and showy. In this same boggy area *Sphagnum amoenum* was seen, and a striking lichen, *Cladonia pycnoclada*. There was the usual profusion of epiphytic bryophytes and ferns, among the latter some small Hymenophyllaceae. *Ophioglossum palmatum* has been collected here, but I was not fortunate enough to find it. A very characteristic epiphytic fern was *Blechnum scandens*. Tree-ferns, species of *Cyathea* and *Alsophila*, were conspicuous in the undergrowth and occasional specimens of *Marattia Kaulfussii* were seen. In places along the paths the banks yielded an abundant harvest of interesting mosses and hepatics, as well as some showy lichens and fungi.

Of the trees, the Leguminosae, so predominant in the dryer forests, were relatively few in number. Much more numerous were various Myrtaceae, Lauraceae, Rubiaceae, Sapotaceae and Rutaceae. A few small specimens of *Podocarpus Sellowii* were the sole representatives of the Gymnosperms. Palms were mostly the smaller species, e. g., *Bactris* and *Geonoma*: but there were some beautiful groups of the exquisite "Jussara" (*Euterpe edulis*).

No botanist visiting Brazil should fail to see the Biological Station at Alto da Serra.

Stanford University, July, 1929.

THE SANTA CRUZ ISLAND PINE

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The pines of insular California have been little understood due largely to the inaccessibility of some of their habitats. Because of the few collections and their wide dispersal throughout the herbaria of the world, the student of these plants has had in the past little material immediately at hand from which to obtain a correct concept of their range of variation and the limits of their distribution. There is little wonder then that many points of difference between two of these pines should have been overlooked for so long a time.

In the early history of west American botanical collecting, Dr. Palmer collected a pine on Guadalupe Island, 200 miles off the coast of northern Baja California. This was sent to Dr. Engelmann who recognized it as a two needle form of the Monterey Pine. He called it *Pinus insignis* var. *binata*, with the cones of *P. insignis* but the leaves